

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**

**THIS PAGE BLANK (USPTO)**



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :

H04Q 3/00

A1

(11) International Publication Number:

WO 98/19471

(43) International Publication Date:

7 May 1998 (07.05.98)

(21) International Application Number: PCT/SE97/01796

(22) International Filing Date: 28 October 1997 (28.10.97)

(30) Priority Data:

9603932-6

28 October 1996 (28.10.96)

SE

(71) Applicant (for all designated States except US): TELEFONAKTIEBOLAGET LM ERICSSON (publ) [SE/SE]; S-126 25 Stockholm (SE).

(72) Inventors; and

(75) Inventors/Applicants (for US only): FOGELHOLM, Rabbe [SE/SE]; Turevägen 54B, S-191 47 Sollentuna (SE). SVEDBERG, Johan [SE/SE]; Vartavägen 6, S-115 24 Stockholm (SE).

(74) Agent: TELEFONAKTIEBOLAGET LM ERICSSON; Patent and Trademark Dept., S-126 25 Stockholm (SE).

(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

## Published

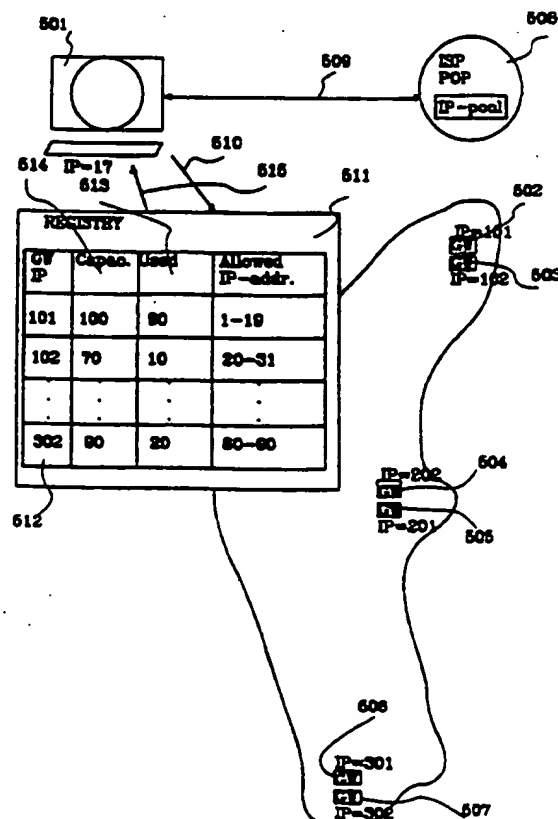
With international search report.

Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: METHOD AND APPARATUS FOR SELECTING ONE VOICE GATEWAY FROM MULTITUDE OF VOICE GATEWAYS, WHICH SHALL SERVE A REMOTE APPLICATION

## (57) Abstract

The present invention discloses a method and apparatus for solving the problem with how to select one voice gateway from a multitude of voice gateways which shall serve a remote application. The problem is solved by selecting a VGWM in dependence of the characteristics of a multitude of VGWMs and the characteristics of the user.



**THIS PAGE BLANK (USPTO)**

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	JP	Japan	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	KE	Kenya	NL	Netherlands	VN	Viet Nam
CG	Congo	KG	Kyrgyzstan	NO	Norway	YU	Yugoslavia
CH	Switzerland	KP	Democratic People's Republic of Korea	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KR	Republic of Korea	PL	Poland		
CM	Cameroon	KZ	Kazakhstan	PT	Portugal		
CN	China	LC	Saint Lucia	RO	Romania		
CU	Cuba	LJ	Liechtenstein	RU	Russian Federation		
CZ	Czech Republic	LK	Sri Lanka	SD	Sudan		
DE	Germany	LR	Liberia	SE	Sweden		
DK	Denmark			SG	Singapore		
EE	Estonia						

METHOD AND APPARATUS FOR SELECTING ONE VOICE GATEWAY FROM MULTITUDE OF VOICE GATEWAYS, WHICH SHALL SERVE A REMOTE APPLICATION

#### TECHNICAL FIELD OF THE INVENTION

The present invention relates to Internet and telecommunication in general and to optimal selection of voice gateways in particular.

#### 5 DESCRIPTION OF RELATED ART

A telephone user, hereafter called a subscriber, may, by using a modem, connect to an ISP (Internet Service Provider) and thus get access to the Internet through his regular voice telephone. The drawback is that while the subscriber is using his internet  
10 account (surfing) his phone is busy and therefore will anyone dialling to the subscriber get a busy-tone. This can be solved as described in the Swedish application SE-9602212-4 by forwarding calls to the subscriber to a voice gateway. The voice gateway handles the translation between voice and internet and the  
15 subscriber will receive a message indicating a waiting voice call and can connect to the calling party using state-of-the-art voice-over-internet technology. This way the subscriber may simultaneously be connected to internet and using his voice phone.

20 The subscriber may also place an outgoing call through the voice gateway in a similar manner. For a deeper description of the above mentioned ideas please refer to SE-9602212-4.

To be able to maintain a reasonable good speech quality when transferring voice over internet it is necessary to minimise the  
25 number of router hop. This problem is not solved in the related art.

#### SUMMARY OF THE INVENTION

The present invention disclose a method and apparatus for solving the problem with how to select one voice gateway from a multitude of voice gateways which shall serve a remote application.

5 The purpose of the present invention is to be able to select an optimal voice gateway to use as a resource for taking incoming and placing outgoing voice calls during an internet session.

The problem, described above, regarding how to select an optimal voice gateway is solved by selecting a VGWM from a table of VGWM in dependence of the characteristics of the VGWMs and the  
10 characteristics of the user.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

Figure 1 shows in overview a logical network model.

Figure 2 shows in more detail the phone-doubler and its interfaces.

15 Figure 3 displays a physical network model.

Figure 4 shows an flowchart of a preferred embodiment according to the invention.

Figure 5 shows an overview of an preferred embodiment according to the invention.

#### **20 DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS**

I the following description, for purposes of explanation and not limitation, specific details are set forth, in order to provide a thorough understanding of the present invention. However, it will be apparent to one skilled in the art that the present invention  
25 may be practised in other embodiments that depart from these specific details. In other instances, detailed descriptions of well known methods, devices, and circuits are omitted so as not to obscure the description of the present invention with unnecessary detail.

In figure 1 is a general overview of the surroundings of the network and how the phone-doubler interfaces with its neighbours. With 101 is a user who is connected to the phone-doubler 102 denoted. The phone-doubler 102 is also connected to the ISP (Internet Service Provider) 103, to the ISDN (Integrated Services Digital Network) 104 and to ISP-adaptations 105. Such adaptations could for instance be a PCAU (PSTN Control Adaptation Unit) 106. The PCAU 106 is a unit that mediates between phone-doubler 102 and the network operators PSTN network, for the purpose of activation and deactivation of call diversions. Call diversion is an integral part of the workings of the phone-doubler. Another adaptation unit can be a CCAU (Customer Care Adaptation Unit) 107, which is a unit that mediates between phone-doubler 102 and the customer care system of the ISP. The last adaptation unit shown in figure 1 is the BCAU (Billing Centre Adaptation Unit) 108, which is a unit that mediates between phone-doubler 102 and the billing centre of the ISP.

In figure 2 a more detailed description of the inner working of the phone-doubler and its interfaces is shown. The user 201 is still present and is utilising the phone-doubler 202 through an UI (User Interface) 203. The UI could for instance be a Microsoft Windows application giving the user a windows user interface for handling the phone-doubler services. The user is using a client software 204 which could be the just mentioned windows application handling the communication with the gateway 206 over a CLGI (Client Gateway Interface) 205. The gateway 206 is located on the ISP 209 premises. The gateway 206 can be located at different geographical locations. The gateway 206 comprises a gateway registry 207 which is common to all subscribers to the phone-doubler services, and at least one VGWM (Voice GateWay Module) 208. The VGWM 208 processes the call and speech transmissions and can handle several calls simultaneous.



The ISP has for operation and maintenance a OMI (Operation and Maintenance Interface) 210 to the phone-doubler 202. An PRI (Pimary Rate Interface) 211 connects the phone-doubler 202 with the ISDN 212.

5 For communication between the phone-doubler 202 and the ISP-adaptations 213 a number of different interfaces are used. PCAI (PSTN Control Adaptation Interface) 214 for communication with PCAU 215, CCAI (Customer Care Adaptation Interface) 216 for communication with CCAU 217 and BCAI (Billing Centre Adaptation  
10 Interface) for communication with BCAU 218.

The client 204 is running on a PC (Personal Computer) 301 in figure 3, located at the users premises 302 and connected to the ISP's POP (Point Of Presence) 303, at the ISP's premises 304 via a modem 305 and PSTN 306. The PC 301 is given an IP-address 307  
15 by the ISP. This is normally done dynamically when connecting to the POP 303. The users normal telephone line 308 is used for connecting between the modem 305 and the PSTN 306.

One or several VGWM 309 is connected to the ISP's IP network 310, typically on the same switched Ethernet as the POP but not  
20 necessarily. Each VGWM 309 has its own IP-address, and the registry 311 may have an IP-address of its own, or share the IP-address of one of the VGWM's 309.

Each VGWM 309 is connected to ISDN 312 via PRI.

One registry node 311 can handle several VGWM 309. The registry  
25 node 311 can physically be remotely placed. An ISP can have one central registry node 311 and several distributed VGWM 309.

The client 204 in figure 2 stores a number of different data items such as:

- Country code

- Area code (including trunk prefix)
- Telephone number (local number)
- Service preferences
- client IP address (volatile)
- 5 • Hostname of registry
- VGWM IP address (volatile)
- ISDN number to VGWM cluster (this may be a group number)
- Reject incoming calls (volatile, settable from the GUI)

10 The combination of country code, area code, and local number identifies each subscriber uniquely.

The VGWM IP address attribute also represents the state of the client: A null address indicates that the client is signed-off from the phone-doubler service, any other address indicates that the client is signed-on.

15 The registry 311 holds a subscriber record for each client, where each record comprises the following attributes:

- telephone number (key, persistent, made up from country code, area code, and local number)
- 20 • password (persistent, stored with a one-way function encryption)
- client IP address (secondary key, volatile)
- user id (persistent)
- service preferences (persistent)
- number of sign-on (persistent)
- 25 • number of incoming calls (persistent)
- number of outgoing calls (persistent)
- first sign-on (persistent)
- last sign-on (persistent)

The client IP address attribute also represents the state of the subscriber record, a null IP address states that the client 204 is signed-off, any other address states that the client 204 is signed-on.

- 5 When a user 201 is connected to the Internet, the IP address of the client 307 is entered into the subscriber record. Since both the telephone number and this IP address are keys, an PSTN-to-IP association between the telephone number and IP address is maintained in the subscriber record.
- 10 Whenever an event occurs in the phone-doubler service relating to the registry, a record is created in the registry 311 and stored in the registry log. The registry log contains records of events, relating to the session that takes place between a sign-on and a sign-off. A registry log record is created when a subscriber
- 15 record changes state to signed-off, or when a subscriber record is deleted. The registry log record comprises the following attributes:
- Record id (sequence number)
  - Termination date (timestamp of session termination)
  - 20 • Client IP address
  - user id
  - User's telephone number
  - Sign-on date
  - Duration
  - 25 • Number of incoming calls
  - Number of outgoing calls
  - Termination code (indicating which normal event or exception that terminated the session)

The phone-doubler can have one or several VGWM's. Each of these

30 VGWM's holds a record of each call or call attempt made through

that particular VGWM. The call record may comprise the following attributes:

- Record id (per-VGWM sequence number)
- Date and time (timestamp of the completed log record)
- 5 • Client IP address and port
- User's telephone number
- Direction (incoming or outgoing)
- VGWM IP address and port
- VGWM ISDN number
- 10 • B-number (same as user's telephone number for incoming call)
- Call set-up date and time
- Duration
- Sent packages
- Received packages
- 15 • Answer state. Answered, rejected or not answered
- Termination reason. User, client, ISDN or VGWM.

For the phone-doubler service to be able to handle a large number of users 201, or to be able to handle users 201 geographically spread out, several VGWM's 208 are needed. These VGWM's 208 can be geographically far from each other so that a user 201 located in one part of the country can use the VGWM 208 closest to him to be able to minimise the path between the user 201 and the VGWM 208 on the internet. This is important to minimise the number of router hop since these introduces packet delays which can be of some problem to a real-time service like voice when transported over a packet-switched network.

When the user 201 signs-on to the phone-doubler service the registry 207 selects a suitable VGWM 208 to serve the user 201. This selection can be performed in dependence of the load of the

VGWM 208, the geographically location of the VGWM 208 and the user 201, the signalling load in the network etc.

In this preferred embodiment, while referring to figure 4 and figure 2, the user 201 starts an internet session 401. The user 5 201 then signs-on to the phone-doubler service 402. In the sign-on procedure the client 204 will send its IP-address to the registry 207, 403. The registry 207 receives and stores the client 204 IP-address 404. The registry 207 compares the received IP-address with a table, stored at the registry 207, of IP- 10 addresses and VGWM's 208. The comparison results in a list of approved VGWM's 208. From the list, the registry 207 selects the VGWM 208 with the most available capacity by comparing the number of currently signed-on users 201 with the available capacity 405. The registry 207 also checks whether the maximum number of 15 allowed users 201 will not be exceeded and that the selected VGWM 208 is actually alive, and not disabled. This can be done by sending a short message to the VGWM 208 and expect an answer. The registry 207 then sends the IP-address of the selected VGWM 208 to the client 204, 406 and the client 204 receives and stores the 20 IP-address of the VGWM 208 for future use 407.

In another preferred embodiment the registry 207 do not send the IP-address of the selected VGWM 208 to the client 204 but stores internally the selected VGWM 208. When the user 201 wants to place an outgoing call, the client 204 connects to the registry 25 207. The registry 207 performs an authentication process with the client 204 and, if the authorisation goes well, acts as a mediator between the client 204 and the VGWM 208. This is to increase the security in the phone-doubler service.

In figure 5 a preferred embodiment is further explained. A user 30 501 is located in Kiruna in northern Sweden. In Kiruna is two VGWM located 502, and 503 further is VGWM's located in Stockholm

504, and 505 and in Malmoe 506, and 507. The user 501 connects to internet 509 through the ISP POP 508 and is assigned IP-address 17. For purpose of simplicity two or three digit IP-addresses are used and not the real format. The format of the IP-address is of  
5 no importance for this invention. The user 501 then assigns to the phone-doubler service 510. The registry 511 checks the stored table 512 and finds that two VGWM's is suitable for the user 501, namely VGWM 502 and 503 with IP-addresses 101 and 102 located in Kiruna. The registry 511 then checks which VGWM has the most  
10 available capacity by comparing the number of currently signed-on users with the number of maximum signed-on users 514. The registry concludes that VGWM 502 with IP-address 102 has the most available capacity and sends 515 the IP-address of the VGWM 503 to the user 501.

15 The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope  
20 of the following claims.

**CLAIMS**

1. A method for selecting a VGWM, used for placing an outgoing call from a user during an ongoing internet session, CHARACTERISED in that a registry application selects one VGWM from a table of VGWMs in dependence of the characteristics of said selected VGWM and the characteristics of said user.
2. A method according to claim 1, CHARACTERISED in that said table comprises, for each VGWM, a range of allowed user IP-addresses and that said registry application selects a VGWM further in dependence of if the users IP-adress is allowed.
3. A method according to claim 1, CHARACTERISED in that said table comprises, for each VGWM, a range of allowed user-ids and that said registry application selects a VGWM further in dependence of if the users user-id is allowed.
4. A method according to claim 2 or 3, CHARACTERISED in that the characteristics of said selected VGWM comprises the geographical position, the position in the network, the load of the selected VGWM, the load of other VGWMs and that said characteristics of the user comprises the geographical position, the network position, the IP-adress, the user-id, the priority of the user.
5. A method according to claim 1, CHARACTERISED in that said user contacts said registry application, that said registry application in dependence of said clients IP-adress, occupancy levels of said VGWMs and availability of said VGWMs selects a first VGWM, that said registry application transmits the IP-adress of said first VGWM to said user and that said user uses said transmitted IP-adress for communication with said first VGWM.

6. A method according to claim 1, CHARACTERISED in that said user contacts said registry application, that said registry application in dependence of said clients IP-adress, occupancy levels of said VGWM and availability of said VGWM selects a first VGWM, that said registry application stores the identity of said selected VGWM and that said registry application instructs said selected VGWM to place an outgoing call for said user.
7. An apparatus for selecting a VGWM, used for placing an outgoing call from a user during an ongoing internet session, CHARACTERISED in a registry application arranged to select one VGWM from a table of VGWMs in dependence of the characteristics of said selected VGWM and the characteristics of said user.
8. An apparatus according to claim 7, CHARACTERISED in that said table comprises, for each VGWM, a range of allowed user IP-addresses and that said registry application is arranged to select a VGWM further in dependence of if the users IP-adress is allowed.
9. An apparatus according to claim 7, CHARACTERISED in that said table comprises, for each VGWM, a range of allowed user-ids and that said registry application is arranged to select a VGWM further in dependence of if the users user-id is allowed.
10. An apparatus according to claim 8 or 9, CHARACTERISED in that the characteristics of said selected VGWM comprises the geographical position, the position in the network, the load of the selected VGWM, the load of other VGWMs and that said characteristics of the user comprises the geographical position, the network position, the IP-adress, the user-id, the priority of the user.



5 11. An apparatus according to claim 7, CHARACTERISED in a client application arranged to contact said registry application, that said registry application is arranged to, in dependence of said clients IP-address, occupancy levels of said VGWMs and availability of said VGWMs select a first VGWM, that said registry application is arranged to transmit the IP-address of said first VGWM to said client application and that said client application is arranged to use said transmitted IP-address for communication with said first VGWM.

10 12. An apparatus according to claim 1, CHARACTERISED in a client application arranged to contact said registry application, that said registry application is arranged to, in dependence of said clients IP-address, occupancy levels of said VGWMs and availability of said VGWMs select a first VGWM, that said  
15 registry application stores the identity of said selected VGWM and that said registry application is arranged to instruct said selected VGWM to place an outgoing call for said user.

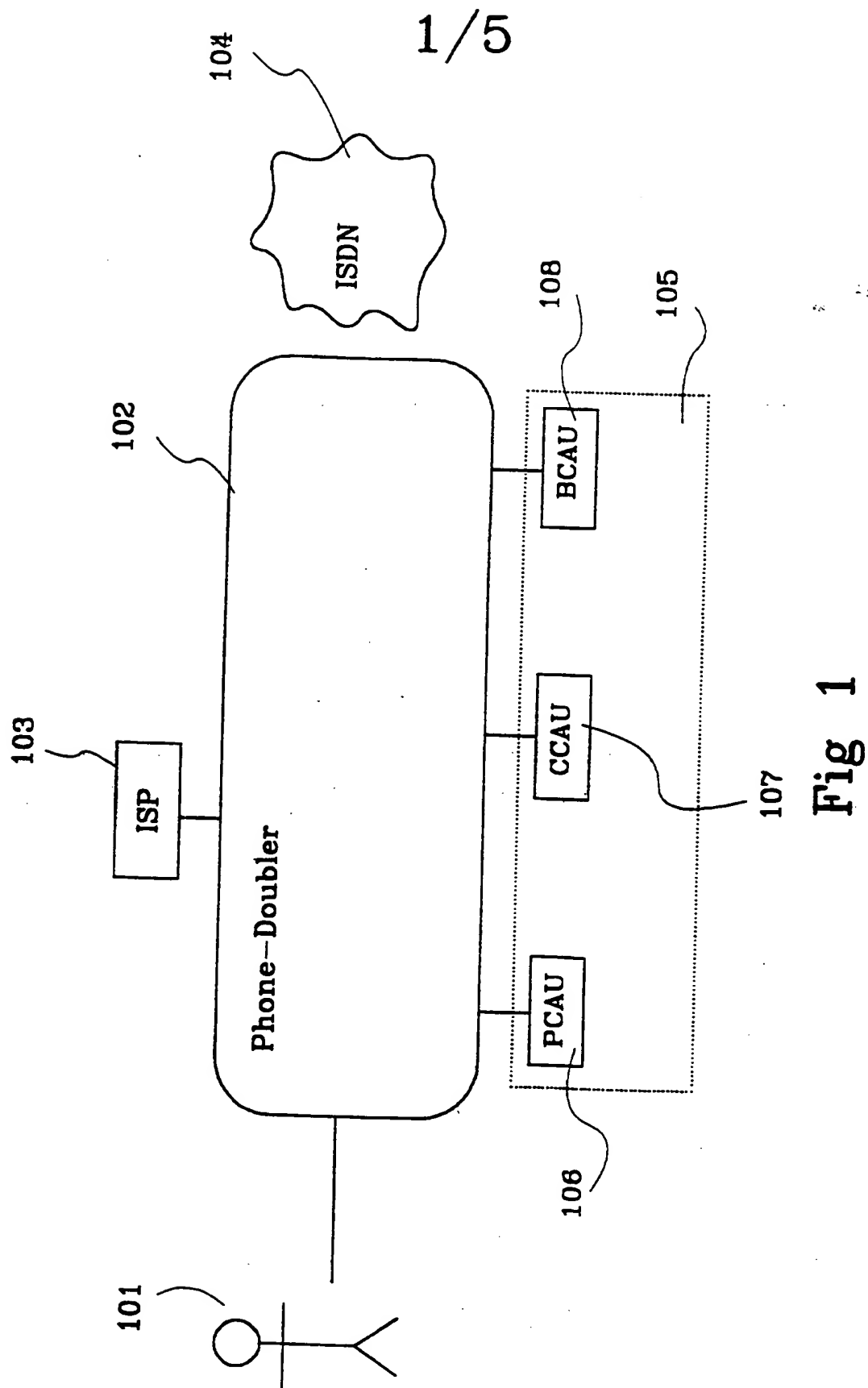


Fig 1

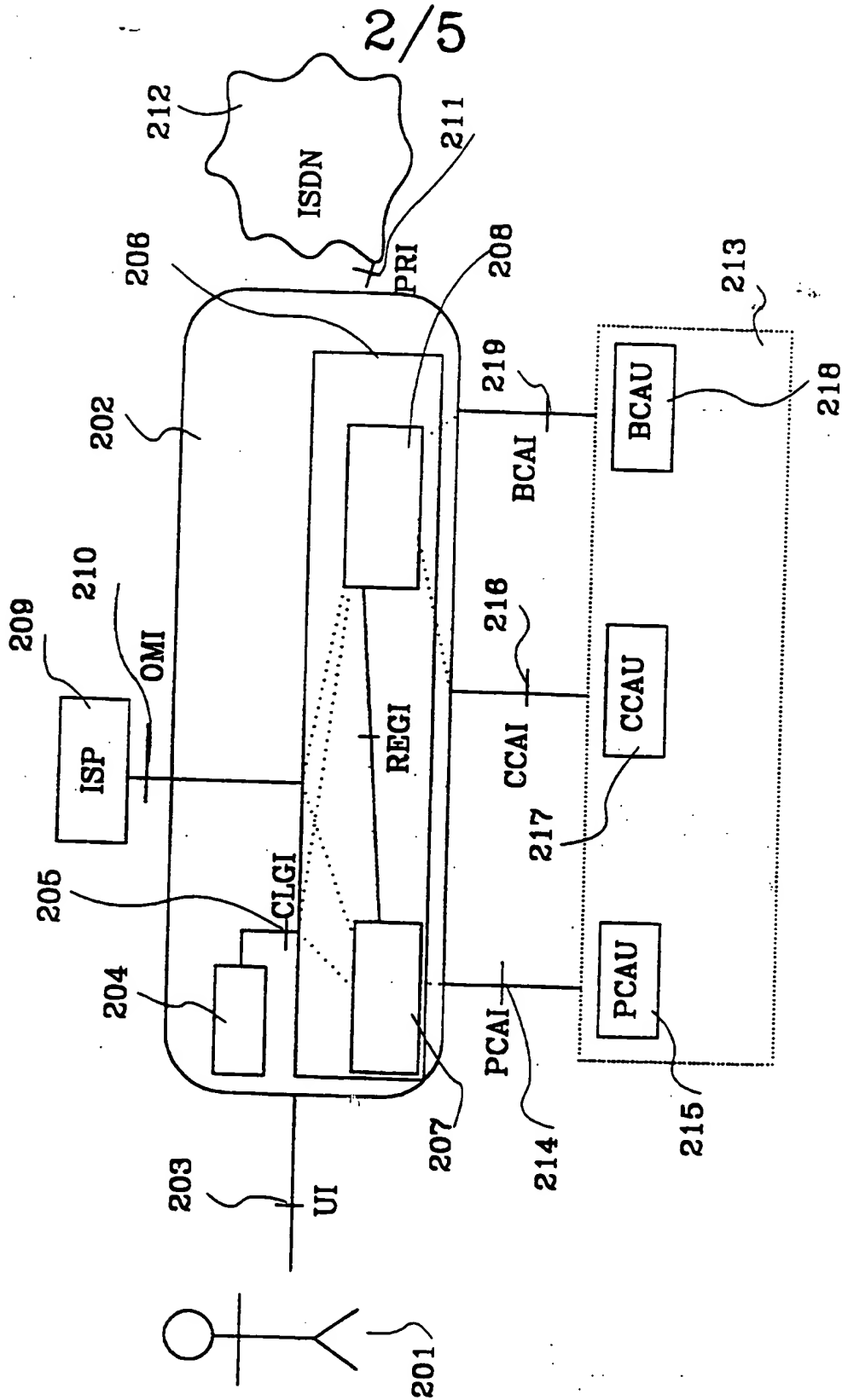


Fig 2

3/5

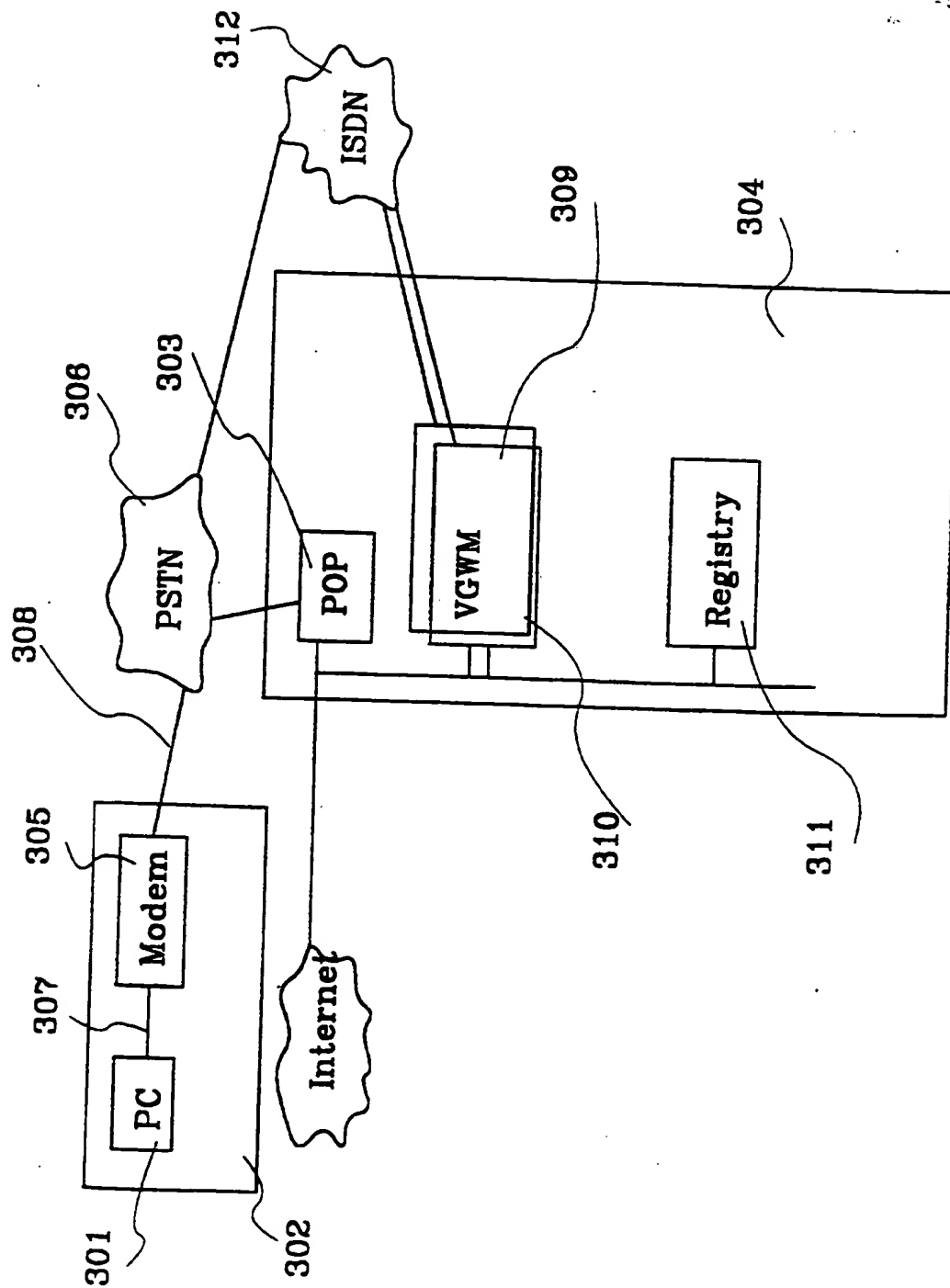


Fig3

4/5

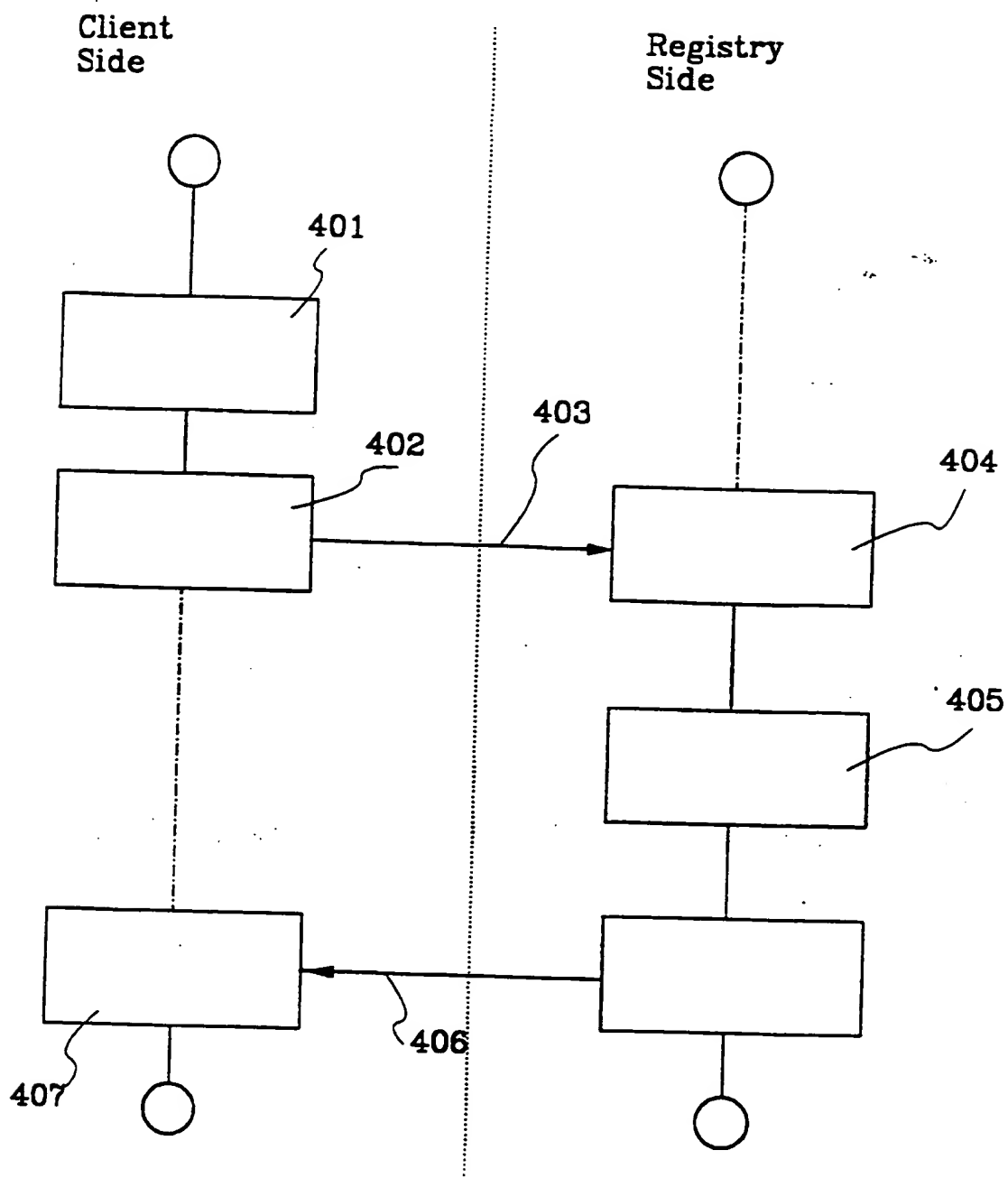


Fig. 4

5/5

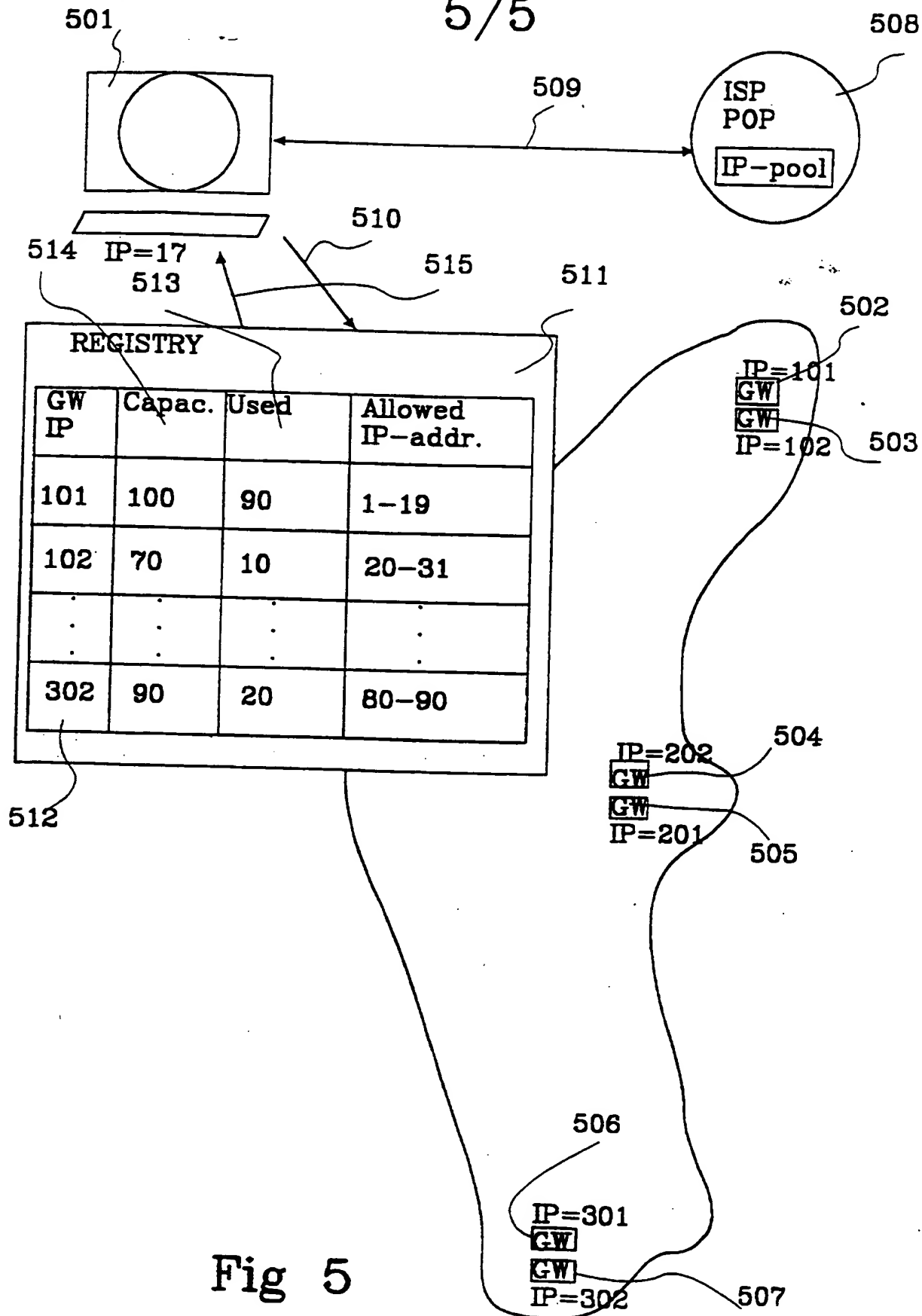


Fig 5

1  
INTERNATIONAL SEARCH REPORT

International application No.  
PCT/SE 97/01796

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC6: H04Q 3/00  
According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0771095 A2 (AT&T CORP), 2 May 1997 (02.05.97), abstract	1-12
A	EP 0169726 A2 (RACAL RESEARCH LIMITED), 29 January 1986 (29.01.86), page 4, line 17 - page 5, line 5	1-12

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

\* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "B" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

3 April 1998

Date of mailing of the international search report

07 -04- 1998

Name and mailing address of the ISA/  
Swedish Patent Office  
Box 5055, S-102 42 STOCKHOLM  
Facsimile No. +46 8 666 02 86

Authorized officer

Cecilia Sandell  
Telephone No. +46 8 782 25 00

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

02/03/98

International application No.

PCT/SE 97/01796

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
EP	0771095	A2	02/05/97	CA	2184209 A	25/04/97
				JP	9214564 A	15/08/97
EP	0169726	A2	29/01/86	SE	0169726 T3	
				GB	2162404 A,B	29/01/86
				US	4748655 A	31/05/88